LWG
LOWER WILLAMETTE GROUP

PORTLAND HARBOR RI/FS

INTERIM DELIVERABLE FOR HUMAN HEALTH RISK ASSESSMENT:

HUMAN HEALTH TOXICITY VALUES

FINAL

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1.0 Introduction

Toxicity values provide a quantitative estimate of the potential for adverse effects resulting from exposure to a chemical. Toxicity values are used in risk assessment to quantify the likelihood of adverse effects occurring at different levels of exposure to a chemical. This interim deliverable presents toxicity values that are proposed for use in the Baseline Human Health Risk Assessment (HHRA) for the Portland Harbor Superfund Site.

Toxicity values are typically identified in the HHRA for chemicals of potential concern (COPCs). COPCs for human health will initially be identified following each round of investigation in the Site Characterization Summary Reports. The final COPCs will be selected in the Baseline HHRA. Because the COPCs have not yet been identified for the HHRA, toxicity values were identified for all chemicals detected in samples collected during Round 1 of the remedial investigation/feasibility study (RI/FS) to support the HHRA.

Round 1 was conducted in 2002 and focused primarily on chemical concentrations in fish and shellfish tissue and beach sediments. Black crappie, carp, smallmouth bass, brown bullhead, and crayfish were the fish and shellfish species collected during Round 1 to support the HHRA. Beach sediment samples were also collected to support the HHRA. Chemicals detected in these samples were used to identify the toxicity values in this interim deliverable.

If additional chemicals are selected as COPCs in the HHRA, toxicity values will be identified for those chemicals at that time. If chemicals included in this interim deliverable are not selected as COPCs, toxicity values for those chemicals will not be included in the HHRA. The toxicity values presented in this interim deliverable will also be reviewed prior to completing the Baseline HHRA and will be updated to incorporate revised toxicity data, as appropriate.

The toxicity values are shown in Table 1. The following sections discuss the toxicity values and describe how they were selected.

2.0 Carcinogenic Toxicity Values

Slope factors (SFs) are used to quantify the response potency of potential carcinogens. SFs are derived from either human epidemiological or animal studies by applying a mathematical model to the data set to extrapolate from the high doses in studies to the lower exposure levels expected for human contact in the environment (EPA 1989). The SF is an upper-bound estimate or maximum likelihood estimate of the probability of a response over a lifetime.

Slope factors are available for oral and inhalation exposure pathways. The inhalation exposure pathway will not be quantitatively evaluated in the HHRA, so inhalation SFs were not selected as toxicity values.

3.0 Noncarcinogenic Toxicity Values

A chemical that exhibits adverse effects other than cancer or mutation-based developmental effects is believed to have a threshold (i.e., a dose below which no adverse effect is expected to occur). Reference doses (RfDs) are typically used as toxicity values for chemicals with noncarcinogenic effects. A chronic RfD is defined as a daily dose to which humans, including sensitive subpopulations, may be exposed throughout their lifetimes without adverse health effects.

Reference doses are available for oral and inhalation exposure pathways. The inhalation exposure pathway will not be quantitatively evaluated in the HHRA, so inhalation RfDs were not selected as toxicity values.

Chronic RfDs are specifically developed to be protective of long-term exposures to a chemical. Because the HHRA will evaluate long-term exposures, chronic RfDs were selected when available. If an RfD for a different duration was selected because a chronic RfD was not available, the exposure duration is noted in Table 1.

4.0 Sources of Toxicity Values

The following hierarchy of sources of toxicity values is currently recommended for use at Superfund sites (EPA 2003):

1 Tier 1 – EPA's Integrated Risk Information System (IRIS) database is the preferred source of information because it normally represents the official EPA scientific position regarding the toxicity of the chemicals based on the data available at the time of the review. IRIS contains RfDs and SFs that have gone through a peer review and EPA consensus review.

2 Tier 2 - EPA's Provisional Peer Reviewed Toxicity Values (PPRTVs) are toxicity values derived for use in the Superfund Program when such values are not available in IRIS. PPRTVs are derived after a review of the relevant scientific literature using the methods, sources of data and guidance for value derivation used by the EPA IRIS Program. The PPRTV database includes RfDs and SFs that have undergone internal and external peer review. The Office of Research and Development/ National Center for Environmental Assessment/Superfund Health Risk Technical Support Center (STSC) develops PPRTVs on a chemical-specific basis when requested by EPA's Superfund program.

3 Tier 3 - Tier 3 includes additional EPA and non-EPA sources of toxicity information. Priority is given to those sources of information that are the most current, the basis for which is transparent and publicly available, and which have been peer reviewed. Tier 3 sources may include, but need not be limited to, the following sources:

- The California Environmental Protection Agency (Cal EPA) Toxicity Criteria Database includes SFs that have been peer reviewed.

- The Agency for Toxic Substances and Disease Registry (ATSDR) Minimal Risk Levels (MRLs) are similar to RfDs and are peer reviewed.
- HEAST toxicity values are currently under review by the STSC to derive PPRTVs. The toxicity values remaining in HEAST are considered Tier 3 values.

In accordance with the above hierarchy, toxicity values from IRIS for both noncarcinogenic and carcinogenic effects were selected when available. If a toxicity value was not available from IRIS, toxicity values from the PPRTV database were selected, if available. In the absence of toxicity values from either IRIS or the PPRTV database, toxicity values from HEAST were selected, if available. The source of the cancer or noncancer toxicity value is indicated in Table 1. The date shown in Table 1 indicates the date of the database search for IRIS toxicity values and PPRTVs. For HEAST, the date indicates the most recent version of published HEAST toxicity values.

4.1 CHEMICALS WITH SURROGATE TOXICITY VALUES

For some chemicals, if a toxicity value was not available from the above hierarchy, a structurally similar chemical was identified as a surrogate. The reference dose or slope factor for the surrogate chemical was selected as the toxicity value and the surrogate chemical was indicated in Table 1. The following chemicals have toxicity values from surrogate chemicals:

- Butyltin ion. Toxicity values were identified from the recommended hierarchy for dibutyltin and tributyltin. Toxicity of alkyltin compounds depends on the number of alkyl side-chains, with monoalkyl tin being the least and trialkyl tin the most toxic (NLM 2004). Therefore, dibutyltin is thought to be more similar to butyltin than tributyltin in toxicity, and is more toxic than butyltin. As a health protective approach, the toxicity value for dibutyltin was selected as a surrogate for butyltin ion.

- Tetrabutyltin. As discussed for butyltin ion, toxicity values were identified for dibutyltin and tributyltin. Tetrabutyltin is less toxic than tributyltin, but more toxic than dibutyltin (NLM 2004). As a health protective approach, the toxicity value for tributyltin was selected as a surrogate for tetrabutyltin.

- Tributyltin ion. The available toxicity value for tributyltin is for tributyltin oxide. However, the Round 1 results were for tributyltin ion. The tributyltin oxide toxicity value was selected as a surrogate for tributyltin ion.

- Acenaphthylene. IRIS classifies acenaphthylene as a category D carcinogen (not classifiable as to human carcinogenicity), and therefore, is considered a

noncarcinogenic polycyclic aromatic hydrocarbon (PAH). Acenaphthene is the noncarcinogenic PAH most similar in structure and carbon number to acenaphthylene. Therefore, the acenaphthene toxicity value was selected as a surrogate for acenaphthylene.

- Benzo(g,h,i)perylene. IRIS classifies benzo(g,h,i)perylene as a category D carcinogen (not classifiable as to human carcinogenicity), and therefore, is considered a noncarcinogenic polycyclic aromatic hydrocarbon (PAH). Of the noncarcinogenic PAHs most similar in structure and carbon number to benzo(g,h,i)perylene, pyrene has the lowest toxicity value and is therefore, considered the most toxic. As a health protective approach, the pyrene toxicity value was selected as a surrogate for benzo(g,h,i)perylene.

- Phenanthrene. IRIS classifies phenanthrene as a category D carcinogen (not classifiable as to human carcinogenicity), and therefore, is considered a noncarcinogenic polycyclic aromatic hydrocarbon (PAH). Of the noncarcinogenic PAHs similar in structure and carbon number to phenanthrene, pyrene has the lowest toxicity value and is therefore, considered the most toxic. As a health protective approach, the pyrene toxicity value was selected as a surrogate for phenanthrene.

- Endrin aldehyde. Endrin aldehyde can occur as an impurity of endrin or as a degradation product (ATSDR 1996). The toxicity value for endrin was selected as a surrogate for endrin aldehyde.

- Endrin ketone. Endrin ketone can occur as an impurity of endrin or as a degradation product (ATSDR 1996). The toxicity value for endrin was selected as a surrogate for endrin ketone.

- 4-Methylphenol. IRIS has toxicity values for 2-methylphenol and 3-methylphenol, but not 4-methylphenol. The toxicity values for 2-methylphenol and 3-methylphenol are the same. The toxicity value for 2-methylphenol was selected as a surrogate for 4-methylphenol.

EPA Region 10 will be consulted to verify that PPRTV or toxicity values from another source in the recommended hierarchy do not exist for these chemicals. If a toxicity value can be determined, it will be used in the HHRA instead of the surrogate chemical toxicity value.

4.2 CHEMICALS LACKING TOXICITY VALUES

Only one chemical detected in Round 1 samples for the HHRA, delta-hexachlorocyclohexane, did not have available toxicity values or appropriate surrogate chemicals from sources included in the hierarchy. An STSC review concluded that the other hexachlorocyclohexane isomers could not be used as

surrogates for delta-hexachlorocyclohexane due to differences in toxicity (EPA 2002). EPA Region 10 will be consulted to verify that PPRTVs or toxicity values from another source in the recommended hierarchy do not exist for delta-hexachlorocyclohexane. If a toxicity value can be determined, it will be used in the HHRA. Otherwise, the potential risk from delta-hexachlorocyclohexane will be discussed qualitatively in the uncertainty assessment of the HHRA.

Toxicity values were not identified for lead because lead will be evaluated using blood lead levels predicted by the Integrated Exposure Uptake Biokinetic (IEUBK) model. The input parameters that will be used in the IEUBK model to assess lead exposures will be determined following discussions with EPA and its partners.

5.0 Toxicity Values for Chemical Mixtures

Some toxicity values are based on exposure to chemical mixtures and not to individual chemicals. As a result, the risks will be evaluated for the combined exposure to the chemicals and not on an individual chemical basis. The chemicals that will be evaluated as mixtures are indicated in Table 1 and discussed below.

- Chlordane. The chlordane toxicity values were derived for technical chlordane, which is composed of a mixture of chlordane isomers. The chlordane isomers analyzed in Round 1 samples were alpha-chlordane, trans-chlordane, cis-nonachlor, trans-nonachlor, and oxychlordane. These isomers will be summed in a total chlordane concentration. The SF and RfD for technical chlordane will be used to evaluate total chlordane.

- Dichlorodiphenyldichloroethane (DDD), Dichlorodiphenyldichloroethylene (DDE), and Dichlorodiphenyltrichloroethane (DDT). Technical DDT includes 2,4'-DDT and 4,4'-DDT, as well as 2,4'-DDE, 4,4'-DDE, 2,4'-DDD, and 4,4'-DDD. DDD, DDE, and DDT have separate SFs included in IRIS. While the SFs were derived for the 4,4' isomers, the SFs will be used to evaluate the sum of the 2,4' and 4,4' isomers because toxicity values are not available for the 2,4' isomers. The DDT RfD was derived for a mixture of the 2,4' and 4,4' isomers and will be used to evaluate the noncancer endpoint of DDT. An RfD is not available for the DDD or DDE isomers, so the DDT RfD was selected as a surrogate toxicity value and will be used to evaluate the noncancer endpoint of DDD and DDE.

- Endosulfan. The toxicity value (RfD) for endosulfan was derived from studies using technical endosulfan, which includes alpha-endosulfan, beta-endosulfan and endosulfan sulfate. These compounds will be summed in a total endosulfan concentration. The RfD for technical endosulfan will be used to evaluate total endosulfan.

- Polychlorinated biphenyls (PCBs). The PCB cancer SF was derived for PCB mixtures based on administered doses of Aroclors to rats. The cancer SF will

be applied to total PCBs, measured either as congeners or Aroclors. If dioxin-like PCB congener concentrations are available, they will be evaluated separately using the 2,3,7,8-tetrachlorodibenzo-p-dioxin (2,3,7,8-TCDD) SF, as described below for dioxins and furans. The PCB SF will be applied to the total PCB congener concentration after subtracting the total dioxin-like PCB congener concentration. The Aroclor 1254 RfD will be used to evaluate the noncancer endpoint for total PCBs, measured either as congeners or Aroclors.

- Dioxins and furans. Toxic equivalency factors (TEFs) will be used to evaluate carcinogenic effects of dioxin and furan congeners and dioxin-like PCB congeners. Concentrations of congeners are multiplied by their TEFs to estimate the toxicity of these congeners relative to 2,3,7,8-TCDD; the resulting concentrations are then summed into a total 2,3,7,8-TCDD toxic equivalent (TEQ). The 2,3,7,8-TCDD SF will be used to evaluate the cancer endpoint of the TEQ for dioxin and furan congeners and for dioxin-like PCB congeners. The current EPA guidance for assessing dioxins recommends not using the RfD approach to evaluate the noncancer endpoint (EPA 2000), so an RfD was not selected for dioxins. The method used to assess the potential impacts from exposure to these compounds will be determined following discussions with EPA and its partners.

6.0 Summary

The toxicity values proposed for use in the HHRA based on the chemicals detected in Round 1 of the RI/FS are presented in Table 1. These toxicity values were selected from data sources in accordance with the hierarchy recommended by EPA (2003) guidance. These toxicity values will be reviewed prior to the Baseline HHRA and will be updated to incorporate new toxicity information, as needed. If additional chemicals are detected in subsequent rounds of the RI/FS and selected as COPCs, toxicity values will be selected for those chemicals using the same process described in this interim deliverable.

7.0 References

ATSDR. 1996. Toxicological Profile for Endrin.

Cal EPA. 2004. Toxicity Criteria Database. Office of Environmental Health Hazard Assessment.

EPA. 1989. Risk Assessment Guidance for Superfund, Volume 1, Human Health Evaluation Manual (Part A), Interim Final. Office of Solid Waste and Emergency Response, EPA/540/1-89/002. December 1989.

EPA. 1993. Provisional Guidance for Quantitative Risk Assessment of Polycyclic Aromatic Hydrocarbons. Office of Health and Environmental Assessment, EPA/600/R-93/089. July 1993.

EPA. 1997. Health Effects Assessment Summary Tables (HEAST), FY-1997 Annual Update. EPA/540/R-97/036. Office of Solid Waste and Emergency Response.

EPA. 2000. Exposure and Human Health Reassessment of 2,3,7,8-Tetrachlorodibenzo-p-Dioxin (TCDD) and Related Compounds, Preliminary Draft. Office of Research and Development, EPA/600/P-00/001Bg. September 2000.

EPA. 2002. Feasibility for Derivation of Provisional Toxicity Values for delta-Hexachlorocyclohexane (CASRN 319-86-8). SRC SF 01-019a-c/10-17-02.

EPA. 2003. OSWER Directive 9285.7-53. Human Health Toxicity Values in Superfund Risk Assessments. December 5, 2003.

EPA. 2004a. Integrated Risk Information System (IRIS) database. Washington, D.C.

EPA. 2004b. Provisional Peer Reviewed Toxicity Values for Superfund (PPRTV) database. Office of Superfund. Washington, D.C.

National Library of Medicine (NLM). 2004. Hazardous Substances Data Bank (HSDB).

Table 1: Toxicity Values

Chem Group	CAS	Chemical	Cancer SFo (mg/kg-day)$^{-1}$	SFo Source, Date	Noncancer RfDo (mg/kg-day)	RfDo Source, Date	Comments
Butyltin	78763-54-9	Butyltin ion	--		5.0E-03	ATSDR MRL, 9/03	Surrogate: Dibutyltin. Intermediate exposure duration.
Butyltin	14488-53-0	Dibutyltin ion	--		5.0E-03	ATSDR MRL, 9/03	Intermediate exposure duration.
Butyltin	1461-25-2	Tetrabutyltin	--		3.0E-04	IRIS, 5/04	Surrogate: Tributyltin oxide
Butyltin	36643-28-4	Tributyltin ion	--		3.0E-04	IRIS, 5/04	Surrogate: Tributyltin oxide
Dioxin		Total Dioxin TEQ	1.5E+05	HEAST, 1997	--		Will use TEQ approach based on 2,3,7,8-TCDD toxicity for cancer. Noncancer will evaluate incremental exposure over background.
Metal	7429-90-5	Aluminum	--		1.0E+00	PPRTV, 5/04	
Metal	7440-36-0	Antimony	--		4.0E-04	IRIS, 5/04	
Metal	7440-38-2	Arsenic	1.5E+00	IRIS, 5/04	3.0E-04	IRIS, 5/04	
Metal	7440-43-9	Cadmium	--		1.0E-03	IRIS, 5/04	Food toxicity value
Metal	16065-83-1	Chromium, trivalent	--		1.5E+00	IRIS, 5/04	
Metal	18540-29-9	Chromium, hexavalent	--		3.0E-03	IRIS, 9/04	
Metal	7440-50-8	Copper	--		4.0E-02	HEAST, 1997	
Metal	7439-92-1	Lead	NA		NA		Not evaluated using SF or RfD
Metal	7439-96-5	Manganese	--		1.4E-01	IRIS, 5/04	Food toxicity value
Metal	7439-97-6	Mercury (tissue)	--		1.0E-04	IRIS, 5/04	Methylmercury toxicity value for tissue evaluation
Metal	7439-97-6	Mercury (sediment)	--		3.0E-04	IRIS, 5/04	Mercuric chloride toxicity value for beach sediment evaluation
Metal	7440-02-0	Nickel	--		2.0E-02	IRIS, 5/04	
Metal	7782-49-2	Selenium	--		5.0E-03	IRIS, 5/04	
Metal	7440-22-4	Silver	--		5.0E-03	IRIS, 5/04	
Metal	7440-28-0	Thallium	--		6.6E-05	IRIS, 5/04	Thallium sulfate toxicity value converted to thallium using IRIS conversion factors.
Metal	7440-66-6	Zinc	--		3.0E-01	IRIS, 5/04	
PAH	91-57-6	2-Methylnaphthalene	--		4.0E-03	IRIS, 5/04	
PAH	83-32-9	Acenaphthene	--		6.0E-02	IRIS, 5/04	
PAH	208-96-8	Acenaphthylene	--		6.0E-02	IRIS, 5/04	Surrogate: Acenaphthene
PAH	120-12-7	Anthracene	--		3.0E-01	IRIS, 5/04	
PAH	56-55-3	Benz(a)anthracene	7.3E-01	Calculated	--		Extrapolated from benzo(a)pyrene using relative potency factor (EPA 1993)
PAH	50-32-8	Benzo(a)pyrene	7.3E+00	IRIS, 5/04	--		

Table 1: Toxicity Values

Chem Group	CAS	Chemical	Cancer SFo (mg/kg-day)$^{-1}$	SFo Source, Date	Noncancer RfDo (mg/kg-day)	RfDo Source, Date	Comments
PAH	205-99-2	Benzo(b)fluoranthene	7.3E-01	Calculated	--		Extrapolated from benzo(a)pyrene using relative potency factor (EPA 1993)
PAH	191-24-2	Benzo(g,h,i)perylene	--		3.0E-02	IRIS, 5/04	Surrogate: Pyrene
PAH	207-08-9	Benzo(k)fluoranthene	7.3E-02	Calculated	--		Extrapolated from benzo(a)pyrene using relative potency factor (EPA 1993)
PAH	218-01-9	Chrysene	7.3E-03	Calculated	--		Extrapolated from benzo(a)pyrene using relative potency factor (EPA 1993)
PAH	53-70-3	Dibenz(a,h)anthracene	7.3E+00	Calculated	--		Extrapolated from benzo(a)pyrene using relative potency factor (EPA 1993)
PAH	206-44-0	Fluoranthene	--		4.0E-02	IRIS, 5/04	
PAH	86-73-7	Fluorene	--		4.0E-02	IRIS, 5/04	
PAH	193-39-5	Indeno(1,2,3-cd)pyrene	7.3E-01	Calculated	--		Extrapolated from benzo(a)pyrene using relative potency factor (EPA 1993)
PAH	91-20-3	Naphthalene	--		2.0E-02	IRIS, 5/04	
PAH	85-01-8	Phenanthrene	--		3.0E-02	IRIS, 5/04	Surrogate: Pyrene
PAH	129-00-0	Pyrene	--		3.0E-02	IRIS, 5/04	
PCBs	1336-36-3	Total PCB Aroclors	2.0E+00	IRIS, 5/04	2.0E-05	IRIS, 5/04	RfDo for Aroclor 1254
PCBs		Total PCB Congeners	--		2.0E-05	IRIS, 5/04	RfDo for Aroclor 1254
PCBs		Total PCB Congeners, adjusted	2.0E+00	IRIS, 5/04	--		
PCBs		Total PCB TEQ	1.5E+05	HEAST, 1997	--		Will use TEQ approach based on 2,3,7,8-TCDD toxicity
Pesticide	309-00-2	Aldrin	1.7E+01	IRIS, 5/04	3.0E-05	IRIS, 5/04	
Pesticide	319-84-6	alpha-Hexachlorocyclohexane	6.3E+00	IRIS, 5/04	8.0E-03	ATSDR MRL, 9/03	
Pesticide	319-85-7	beta-Hexachlorocyclohexane	1.8E+00	IRIS, 5/04	6.0E-04	ATSDR MRL, 9/03	Intermediate exposure duration.
Pesticide	319-86-8	delta-Hexachlorocyclohexane	--	PPRTV, 5/04	--	PPRTV, 5/04	Other hexachlorocyclohexane isomers should not be used as surrogates (EPA 2002)
Pesticide	60-57-1	Dieldrin	1.6E+01	IRIS, 5/04	5.0E-05	IRIS, 5/04	
Pesticide	72-20-8	Endrin	--		3.0E-04	IRIS, 5/04	
Pesticide	7421-93-4	Endrin aldehyde	--		3.0E-04	IRIS, 5/04	Surrogate: Endrin
Pesticide	53494-70-5	Endrin ketone	--		3.0E-04	IRIS, 5/04	Surrogate: Endrin
Pesticide	58-89-9	gamma-Hexachlorocyclohexane	1.3E+00	HEAST, 1997	3.0E-04	IRIS, 5/04	

Table 1: Toxicity Values

Chem Group	CAS	Chemical	Cancer SFo (mg/kg-day)$^{-1}$	SFo Source, Date	Noncancer RfDo (mg/kg-day)	RfDo Source, Date	Comments
Pesticide	76-44-8	Heptachlor	4.5E+00	IRIS, 5/04	5.0E-04	IRIS, 5/04	
Pesticide	1024-57-3	Heptachlor epoxide	9.1E+00	IRIS, 5/04	1.3E-05	IRIS, 5/04	
Pesticide	72-43-5	Methoxychlor	--		5.0E-03	IRIS, 5/04	
Pesticide	8001-35-2	Toxaphene	1.1E+00	IRIS, 5/04	1.0E-03	ATSDR MRL, 8/96	Intermediate exposure duration.
Pest - Chlor	5103-71-9	alpha-Chlordane	NA		NA		Will be included in total Chlordane
Pest - Chlor	27304-13-8	Oxychlordane	NA		NA		Will be assessed as total Chlordane
Pest - Chlor	12789-03-6	Total Chlordane	3.5E-01	IRIS, 5/04	5.0E-04	IRIS, 5/04	
Pest - Chlor	5103-74-2	trans-Chlordane	NA		NA		Will be included in total Chlordane
Pest - Chlor	39765-80-5	trans-Nonachlor	NA		NA		Will be included in total Chlordane
Pest - DDD	53-19-0	2,4'-DDD	NA		NA		Will be included in total DDD
Pest - DDD	72-54-8	4,4'-DDD	NA		NA		Will be included in total DDD
Pest - DDD		Total DDD	2.4E-01	IRIS, 5/04	5.0E-04	IRIS, 5/04	RfDo for DDT
Pest - DDE	72-55-9	4,4'-DDE	NA		NA		Will be included in total DDE
Pest - DDE		Total DDE	3.4E-01	IRIS, 5/04	5.0E-04	IRIS, 5/04	RfDo for DDT
Pest - DDT	789-02-6	2,4'-DDT	NA		NA		Will be included in total DDT
Pest - DDT	50-29-3	4,4'-DDT	NA		NA		Will be included in total DDT
Pest - DDT		Total DDT	3.4E-01	IRIS, 5/04	5.0E-04	IRIS, 5/04	
Pest - Endo	959-98-8	alpha-Endosulfan	NA		NA		Will be included in total Endosulfan
Pest - Endo	33213-65-9	beta-Endosulfan	NA		NA		Will be included in total Endosulfan
Pest - Endo	1031-07-8	Endosulfan sulfate	NA		NA		Will be included in total Endosulfan
Pest - Endo	115-29-7	Total Endosulfan	--		6.0E-03	IRIS, 5/04	
Phenol	106-44-5	4-Methylphenol	--		5.0E-02	IRIS, 5/04	Surrogate: 2-Methylphenol
Phenol	87-86-5	Pentachlorophenol	1.2E-01	IRIS, 5/04	3.0E-02	IRIS, 5/04	
Phenol	108-95-2	Phenol	--		3.0E-01	IRIS, 5/04	
Phthalate	117-81-7	Bis(2-ethylhexyl) phthalate	1.4E-02	IRIS, 5/04	2.0E-02	IRIS, 5/04	
Phthalate	85-68-7	Butylbenzyl phthalate	--		2.0E-01	IRIS, 5/04	
Phthalate	84-66-2	Diethyl phthalate	--		8.0E-01	IRIS, 5/04	
Phthalate	84-74-2	Dibutyl phthalate	--		1.0E-01	IRIS, 5/04	
Phthalate	117-84-0	Di-n-octyl phthalate	--		4.0E-02	PPRTV, 5/04	
SVOC	86-74-8	Carbazole	2.0E-02	HEAST, 1997	--		
SVOC	132-64-9	Dibenzofuran	4.0E-03	HEAST, 1997	--		
SVOC	118-74-1	Hexachlorobenzene	1.6E+00	IRIS, 5/04	8.0E-04	IRIS, 5/04	
SVOC	87-68-3	Hexachlorobutadiene	7.8E-02	IRIS, 5/04	2.0E-04	HEAST, 1997	
SVOC	67-72-1	Hexachloroethane	1.4E-02	IRIS, 5/04	1.0E-03	IRIS, 5/04	

Notes:
SFo Oral slope factor.

Table 1: Toxicity Values

Chem Group	CAS	Chemical	Cancer SFo (mg/kg-day)$^{-1}$	SFo Source, Date	Noncancer RfDo (mg/kg-day)	RfDo Source, Date	Comments
RfDo	Oral reference dose.						
IRIS	Integrated Risk Information System						
PPRTV	Provisional Peer Reviewed Toxicity Value						
ATSDR MRL	Agency for Toxic Substances and Disease Registry Minimum Risk Level.						
Cal EPA	California Environmental Protection Agency Toxicity Criteria Database.						
HEAST	Health Effects Assessment Summary Tables						
NA	Not applicable. Chemical will not be assessed individually.						
--	Not available. A toxicity value was not available from the recommended hierarchy and a surrogate chemical could not be identified.						